



## DEPARTMENT OF ENERGY

### 10 CFR Parts 429 and 430

[EERE-2016-BT-TP-0029]

RIN 1904-AD71

#### **Energy Conservation Program: Test Procedures for Central Air Conditioners and Heat Pumps; Correction**

**AGENCY:** Office of Energy Efficiency and Renewable Energy, Department of Energy.

**ACTION:** Final rule; correcting amendments.

**SUMMARY:** On January 5, 2017, the U.S. Department of Energy (“DOE”) published a final rule that made two sets of amendments to the test procedure for central air conditioners and heat pumps (“CAC/HPs”): amendments to the existing test procedure required for determining compliance with the current energy conservation standards; and establishment of a new test procedure that would be the basis for making efficiency representations as of the compliance date for any amended energy conservation standards. This document corrects typographical errors, omissions, and incorrect cross-references in the Code of Federal Regulations that resulted from the January 2017 final rule. Neither the errors nor the corrections in this document affect the substance of the rulemaking or any conclusions reached in support of the final rule.

**DATES:** Effective [INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

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## **SUPPLEMENTARY INFORMATION:**

### **I. Background**

On January 5, 2017, DOE published a final rule regarding the Federal test procedure for central air conditioner and heat pumps. 82 FR 1426 (“January 2017 final rule”). The January 2017 final rule amended the test procedure for central air conditioners and heat pumps at title 10 of the Code of Federal Regulations (“CFR”) part 430 subpart B appendix M (“Appendix M”) and established a new test procedure at 10 CFR part 430 subpart B appendix M1 (“Appendix M1”). 82 FR 1426. Appendix M provides for the measurement of the cooling and heating performance of central air conditioners and heat pumps using the seasonal energy efficiency ratio (“SEER”) metric and heating seasonal performance factor (“HSPF”) metric, respectively. Appendix M1 specifies a revised SEER metric (“SEER2”) and a revised HSPF metric (“HSPF2”). The test procedures as amended and established in the January 2107 final rule for central air conditioners and heat pumps include a number of typographical errors, omissions, and incorrect cross-references, which may result in confusion in executing the test procedures. The errors and corrections are summarized in the Table I.1.

**Table 1.1 Summary of Errors and Corrections**

CFR section(s)	Description of Error and Correction	Rationale
10 CFR 429.16(a)(1)	<p>Corrects cross-references regarding represented values related to multi-split systems, multi-circuit systems, and multi-head mini-split systems by:</p> <p>1) Replacing “(c)(3)(ii)” with “(c)(3)(iii)”</p> <p>2) Replacing “Additional representations are allowed, as described in paragraph (c)(3)(i) of this section.” With “Additional representations are allowed, as described in paragraphs (c)(3)(i) and (c)(3)(ii) of this section.”</p>	Cross-references did not get updated when the January 2017 final rule added 10 CFR 429.16(c)(3)(i).
10 CFR 429.16(f)(1)(i)(B), 10 CFR 429.16(f)(2)(ii)(A), and 10 CFR 429.16(f)(4)(i)(B)	Removes the language “(b)(3)(i)(C)” and “(b)(3)(i)(B) and replaces with “(b)(3)(iii)” and “(b)(3)(ii)”, respectively	Transcription error – cross-references not properly updated.
Paragraph a of Section 3.6.4 of Appendix M and Paragraph a of Section 3.6.4 of appendix M1	Corrects the instruction regarding compressor speed for the H1 <sub>N</sub> heating mode test.	Instructions for compressor speed limitations for H1 <sub>N</sub> test incorrectly incorporated.
Paragraphs b and c of Section 3.6.6 of appendix M	Corrects incorrect references to HSPF2 in appendix M. HSPF2 is associated with appendix M1. The revision corrects the reference to “HSPF”.	Reference inadvertently made to HSPF2 rather than HSPF.
Section 4.1.3.2 and Section 4.1.4.2 of appendix M	Inserts missing inequalities in the titles, revising “ $Q_c^{k=1}(T_j) \geq BL(T_j) \geq Q_c^{k=2}(T_j)$ ,” to read “ $Q_c^{k=1}(T_j) < BL(T_j) < Q_c^{k=2}(T_j)$ .”	Inequalities inadvertently omitted from the January 2017 final rule.
Sections 4.2.5.1, 4.2.5.2, and 4.2.5.3 of appendix M; Sections 4.2.5.1, 4.2.5.2, and 4.2.5.3 of appendix M1;	Replaces cross-references to section “3.1.9” with “3.1.10”	Cross-references inadvertently not updated.

CFR section(s)	Description of Error and Correction	Rationale
Section 4.2.5.1 of Appendix M; Section 4.2.5.1 of appendix M1	Changes subscript on left side of equation for energy E from “hp” to “h” by replacing “ $\dot{E}_{hp}(T_j) = \dot{E}_{hp}(T_j)$ ” with “ $\dot{E}_h(T_j) = \dot{E}_{hp}(T_j)$ ”.	Transcription error.
Sections 4.2.5.1 of Appendix M; Section 4.2.5.1 of appendix M1	Changes inequality for Case 2 of Section 4.2.5.1 to reflect intent consistent with Sections 4.2.5.2 and 4.2.5.3 by changing “ $T_o(T_j) > T_{cc}$ ” to “ $T_o(T_j) < T_{cc}$ ”	Transcription error.
Section 4.2.6.c of appendix M; Section 4.2.6.c of Appendix M1	Changes designation of booster stage capacity to use the correct superscript “k=3” by replacing “ $Q_h^{k=2}(5)$ ” with “ $Q_h^{k=3}(5)$ ” where the text describes what test is used to obtain the booster stage 5 °F capacity	Transcription error. Booster capacity denoted as k=3 in all other locations throughout test procedure.
Section 4.2.6.2 of appendix M; Section 4.2.6.2 of appendix M1	Changes the inequality in the equation of the title of Section 4.2.6.2 to be consistent with the text, “Capacity Is Greater Than or Equal to the Building Heating Load.” Replaces “<” with “≤”	Incorrect inequality.
Section 4.2.6.3 of appendix M; Section 4.2.6.3 of appendix M1	Changes the title to specify the correct compressor stage for the case, revising “High” to “Booster,” which is the k=3 compressor stage.	Transcription error. Booster capacity denoted as k=3 in all other locations throughout test procedure.
Section 1.2 of appendix M1	Inserts the word “minimum” missing in the definition for “minimum-speed-limiting variable-speed heat pump” to indicate which speed is higher than its value for operation in a 47 °F ambient temperature.	Transcription error – missing word “minimum.”
Section 3.1.4.7 of appendix M1	Replaces incorrect cross-reference to Section “3.14.6” with “3.1.4.6”	Transcription error.

CFR section(s)	Description of Error and Correction	Rationale
Paragraph d to section 3.6.4 Table 14 of appendix M1	Adds explicit description of the compressor speed to be used for the H <sub>4</sub> 5 °F full-capacity heating mode test, consistent with the intent as described in the July 2016 SNOPR and January 2017 Final Rule preamble discussions.	Inadvertent omission of footnote.
Section 4.1.4.2 of appendix M1	Replaces the single instance of “EER2” in the section with “EER”.	Transcription error.
Section 4.1.3.2 of appendix M1	Removes extraneous “(“ in the title line of the section.	Transcription error.

This document identifies and corrects these errors. Neither the errors nor the corrections in this document affect the substance of the rulemaking or any conclusions reached in support of the final rule.

## II. Need for Correction

As published, the regulatory text in the January 2017 final rule may result in confusion due to incorrect symbols in the test procedure equations, typographical errors, incorrect cross-references, and missing footnotes. The following sections provide the rationale for each correction. Because this final rule would correct errors in the text and provide additional detail without making substantive changes in the January 2017 final rule, the changes addressed in this document are technical in nature.

### A. Cross-References at 10 CFR 429.16(a)(1)

The January 2017 Final Rule added provisions for determining represented values for split systems in 10 CFR 429.16(c)(3)(i) but did not make corresponding edits to the cross-references contained within 10 CFR 429.16(a)(1), which describes the additional representations

that are allowed for such systems (*i.e.*, in addition to the required representations). This document corrects this error by updating these cross-references.

#### B. Transcription errors at 10 CFR 429.16(f)

In the January 2017 Final Rule, DOE established provisions for represented values required by the Federal Trade Commission – among them the annual operating cost in cooling mode. These sections rely on the calculated quantities for cooling capacity and SEER in order to determine operating costs but contain incorrect cross-references to the sections where these quantities are calculated. This document corrects the cross-references to refer to the correct sections for represented values of cooling capacity and SEER as adopted by the January 2017 Final Rule.

#### C. Reference to H1<sub>N</sub> Test in Section 3.6.4 of Appendix M and Appendix M1

In the January 2017 Final rule, DOE revised the requirement regarding compressor speed for the H1<sub>N</sub> heating mode test to “allow the compressor speed used for the H1<sub>N</sub> test to be lower than used for the A2 test, provided that the H1<sub>N</sub> capacity is no lower than the A2 cooling capacity.” 82 FR 1426, 1445. However, in codifying this revision in section 3.6.4 of appendix M and section 3.6.4 of appendix M1, DOE did not properly incorporate the changes. In appendix M, DOE inadvertently referred to the H1<sub>2</sub> capacity instead of the H1<sub>N</sub> capacity when making the comparison to the A2 cooling capacity. In appendix M1, DOE omitted the language entirely that allowed the H1<sub>N</sub> compressor speed to be lower than the speed used for the A2 test provided that the H1<sub>N</sub> capacity is no lower than the A2 cooling capacity. This document corrects these errors to reflect the appropriate compressor speed limitations for the H1<sub>N</sub> test that were adopted in the January 2017 Final Rule in both appendix M and appendix M1.

#### D. Reference to HSPF in Section 3.6.6 of Appendix M

The January 2017 Final Rule established the HSPF2 metric as measured per the newly created appendix M1. The HSPF2 metric is not defined for appendix M and does not apply in

any section of that appendix. Rather, the applicable heating metric for appendix M is Heating Seasonal Performance Factor (“HSPF”). This document replaces two erroneous instances of HSPF2 with HSPF in paragraphs b and c of section 3.6.6 of appendix M.

#### E. Inequality Symbols in Sections 4.1.3.2 and 4.1.4.2 of Appendix M

The January 2017 Final Rule retained testing provisions in appendix M to calculate the electrical power consumption of CAC/HPs when building load is between minimum and maximum capacity in order to satisfy the building cooling demand. For two-stage CAC/HPs, section 4.1.3.2 details the case where the system operates *between* low ( $k=1$ ) compressor stage and high ( $k=2$ ) compressor stage in order to satisfy demand. For variable-speed CAC/HPs, section 4.1.4.2 details the case where the system operates at an intermediate compressor speed “i” that is *between* the low and high compressor speeds. In both cases, the title text for these sections reflects the intent of establishing a range of operation. However, in the following inequalities (which restate the title text), the inequality symbols were inadvertently omitted. This document adds the missing inequalities to reflect what was intended in the January 2017 Final Rule.

#### F. Cross-References in Sections 4.2.5.1, 4.2.5.2, and 4.2.5.3 of Appendix M and Appendix M1

The January 2017 Final Rule retained provisions in sections 4.2.5.1, 4.2.5.2, and 4.2.5.3 of appendices M and M1 for additional steps to calculate HSPF (or HSPF2 in the case of appendix M1) for heat pumps having heat comfort controllers. These sections each contain a case where outdoor bin temperatures are greater than the maximum supply temperature,  $T_{CC}$ , and reference section 3.1.9 of the respective appendix for calculating  $T_{CC}$ . However, section 3.1.10 is the correct cross-reference for calculating  $T_{CC}$ . This document corrects the cross-reference from 3.1.9 to 3.1.10 in accordance with the January 2017 Final Rule.

#### G. Symbol Subscripts in Section 4.2.5.1 of Appendix M and Appendix M1

Section 4.2.5.1 of both appendix M and appendix M1 specify calculating the space heating capacity and electrical power of the heat pump, and to denote these capacities and electrical power by using the subscript “hp” instead of “h”. Case 1 of section 4.2.5.1 of both appendices specifies determining total electrical power consumption  $E_h(T_j)$  as specified in section 4.2.1 of the same appendix, and provides an *id est* (“*i.e.*”) statement to illustrate the replacement of subscript “h” with “hp”. Rather than state  $E_h(T_j) = E_{hp}(T_j)$  as intended, the subscript “h” was inadvertently replaced with “hp” on both sides of the equation. This document corrects the errors in these sections.

#### H. Inequality Symbol in Section 4.2.5.1 of Appendix M and Appendix M1

In sections 4.2.5.1, 4.2.5.2, and 4.2.5.3 of both appendix M and appendix M1, Case 1 of each section covers instances where supply air temperature is greater than or equal to the comfort controller maximum supply temperature (*i.e.*,  $T_o(T_j) \geq T_{cc}$ ). Case 2 covers the complimentary scenario where supply air temperature is less than the comfort controller maximum supply temperature (*i.e.*,  $T_o(T_j) < T_{cc}$ ), such that collectively the two Cases cover the full range of possible supply air temperatures in comparison to the comfort controller maximum supply temperature. In section 4.2.5.1 of both appendices, the “less than” symbol in Case 2 was inadvertently codified as a “greater than” symbol. This document corrects this symbol to “less than.”.

#### I. Symbol Superscript in Section 4.2.6.c of Appendix M and Appendix M1

The January 2017 Final Rule established provisions for testing of triple-capacity northern heat pumps, which utilize a third distinct stage of heating capacity—denoted as “boost” or “booster”—that is higher than both the “high” and “low” stages. Section 4.2.6 of both appendix M and appendix M1 describes additional steps for HSPF calculation for triple-capacity northern heat pumps, referring to boost capacity with the superscript notation “k=3” in all but one instance: in section 4.2.6.c, the boost capacity is erroneously referred using the superscript notation “k=2”. (Elsewhere in the test procedure, the notation “k=2” is used to refer to the



“high” stage.) This document corrects that error by updating the superscript to “k=3” to be consistent with the intent established by the January 2017 final rule.

#### J. Inequality Symbol in Section 4.2.6.2 of Appendix M and Appendix M1

The January 2017 Final rule amended provisions for HSPF calculation of triple-capacity northern heat pumps in section 4.2.6. The title of section 4.2.6.2 describes cases where the heat pump operates at high (k=2) compressor capacity at temperature  $T_j$  and its capacity is greater than *or equal to* the building load (*i.e.*, building load is less than or equal to the compressor capacity). In the inequality immediately following, the building load is listed first, and a “less than” symbol “<” is erroneously used rather than a “less than or equal to” symbol (“≤”). This document corrects the symbol using “≤” to indicate a building load less than or equal to capacity, to be consistent with the intent of the section title as established by the January 2017 Final Rule.

#### K. Reference to Booster Capacity in Section 4.2.6.3 of Appendix M and Appendix M1

As discussed in paragraph I, the January 2017 Final rule established provisions for HSPF calculation of triple-capacity northern heat pumps in section 4.2.6. Section 4.2.6.3 describes cases where the heat pump operates at the (k=3) compressor capacity (*i.e.*, boost capacity) at temperature  $T_j$  and its capacity is greater than or equal to the building load. The title of this section erroneously refers to the (k=3) compressor capacity as “high.” Instead, the (k=3) compressor capacity should be referred to as the “booster” capacity (the “high” (k=2) capacity is covered by section 4.2.6.2). This document corrects the title of section 4.2.6.3 to be consistent with the intent established by the January 2017 Final Rule.

#### L. Missing Word “Minimum” in Section 1.2 of Appendix M1

In the January 2017 Final rule, DOE proposed a definition for “minimum-speed-limiting variable-speed heat pump” to refer to heat pumps that vary the minimum compressor speed when operating in outdoor temperatures that are in the range for which the minimum speed performance factors into the HSPF calculation (*i.e.*, between 35°F and 62°F). 82 FR 1426, 1458. However, in codifying this definition in section 1.2 of appendix M1, DOE inadvertently omitted

the word “minimum” when referring to compressor speed at 47°F. This document adds the word “minimum” to the definition of minimum-speed-limiting variable-speed heat pump to reflect the intent established by the January 2017 Final Rule.

#### M. Cross-Reference in Section 3.1.4.7 of Appendix M1

The January 2017 Final Rule established provisions in section 3.1.4.7 of appendix M1 for determining the heating nominal air volume rate to be used in HSPF2 testing. This section omitted a period and erroneously cross-references section 3.14.6 for adjusting airflow—section 3.1.4.6 is the proper cross-reference. This document corrects these errors.

#### N. Missing Footnote in Table 14 of Appendix M1

Compressor speeds for variable-speed compressor systems are specified in Table 14 in section 3.6.4 of appendices M and M1. These sections are supposed to include footnotes that specify the “Heating Full” compressor speed at different outdoor temperature test conditions for systems containing a variable-speed compressor. However, at the optional H4<sub>2</sub> heating test condition (5°F outdoor temperature) in appendix M1, the footnote is missing. (There is no H4<sub>2</sub> test condition for variable-speed heat pumps in appendix M so no footnote is required.) For all other test conditions that utilize a “full” compressor speed, Table 14 to appendix M1 includes footnotes describing the meaning of “full” compressor speed in the context of each test condition. To specify the H4<sub>2</sub> compressor speed for variable-speed heat pumps, a footnote is being added to Table 14 in appendix M1 to specify that the “Heating Full” speed refers to the maximum speed that the system’s controls would operate the compressor in normal operation at 5°F ambient temperature.

This correction is consistent with the discussion provided in the August 24, 2016 supplemental notice of proposed rulemaking (“SNOPR”), in which DOE stated that the full-speed compressor operation for variable-speed heat pumps could be very different at 5°F than it is at 17°F, thus an extrapolation of performance below 5°F using the [17°F compressor speed] trend between 17°F and 5°F is not appropriate. 81 FR 58164, 58193 (“August 2016 SNOPR”).

The regulatory text in the August 2016 SNOPR provided instructional footnotes as to the appropriate “Heating Full” compressor speed for the heating test conditions except for the optional H4<sub>2</sub> heating test condition. 82 FR 58164, 58238. Comment was not received on the appropriate compressor speed at the 5°F condition, and the erroneous omission of the footnote was carried over into the final rule, which adopted the proposal in the August 2016 SNOPR. 82 FR 1426, 1459, 1560. This correction also aligns with current industry test procedures for CAC/HPs (AHRI 210/240 2023) which includes a footnote in the test conditions table for variable-speed heat pumps specifying that the full compressor speed to be used at the 5°F heating test condition is the maximum speed the system controls would operate the compressor at 5°F ambient temperature.

#### O. Reference to EER in Section 4.1.4.2 of Appendix M1

Section 4.1.4.2 of appendix M1 specifies several equations in which variations of the EER metric are used. One of these equations contains the term  $EER^{k=2}$ . In the “where” statement following the equation, which defines each symbol used in the equation,  $EER^{k=2}$  is erroneously referred to as  $EER^{2k=2}$ . This document corrects this error by referring instead to  $EER^{k=2}$ .

#### P. Extraneous Symbols in Section 4.1.3.2 of Appendix M1

The title of section 4.1.3.2 of appendix M1 contains extraneous “(“ symbols preceding the terms  $BL(T_j)$  and  $Q_c^{k=2}(T_j)$ . This document removes these extraneous symbols, consistent with the analogous terms in section 4.1.3.2 of appendix M.

### **III. Procedural Issues and Regulatory Review**

Pursuant to the Administrative Procedure Act, 5 U.S.C. 553(b), DOE has determined there is good cause to find that prior notice and opportunity for public comment on the changes contained in this document are impracticable, unnecessary, or contrary to the public interest.

Neither the errors nor the corrections in this document affect the substance of the January 2017 Final Rule or any of the conclusions reached in support of the final rule. Providing prior notice and an opportunity for public comment on correcting objective, typographical errors and omissions that do not change the substance of the test procedure serves no useful purpose. As such, this rule is similarly not subject to the 30-day delay in effective date requirement of 5 U.S.C. 553(d) otherwise applicable to rules that make substantive changes.

DOE has also concluded that the determinations made pursuant to the various regulatory review requirements applicable to the January 2017 final rule remain unchanged for this final rule technical correction. These determinations are set forth in the January 2017 final rule. 84 FR 1426, 1463-1468.

## **List of Subjects**

### **10 CFR Part 429**

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Reporting and recordkeeping requirements.

### **10 CFR Part 430**

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

## **Signing Authority**

This document of the Department of Energy was signed on November 17, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE

Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on November 18, 2021

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Treena V. Garrett  
Federal Register Liaison Officer,  
U.S. Department of Energy

For the reasons stated in the preamble, DOE corrects parts 429 and 430 of chapter II, subchapter D, of title 10 of the Code of Federal Regulations by making the following correcting amendments:

**PART 429 – CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR  
CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT**

1. The authority citation for part 429 continues to read as follows:

**Authority:** 42 U.S.C. 6291-6317; 28 U.S.C. 2461 note.

2. Section 429.16 is amended:

- a. By revising the table in paragraph (a)(1);
- b. In paragraph (f)(1)(i)(B) by removing “(b)(3)(i)(C)” and “(b)(3)(i)(B)” and adding in their place “(b)(3)(iii)” and “(b)(3)(ii)”, respectively;
- c. In paragraph (f)(2)(ii)(A) by removing “(b)(3)(i)(C)” and “(b)(3)(i)(B)” and adding in their place “(b)(3)(iii)” and “(b)(3)(ii)”, respectively;

d. In paragraph (f)(4)(i)(B) by removing “(b)(3)(i)(C)” and “(b)(3)(i)(B)” and adding in their place “(b)(3)(iii)” and “(b)(3)(ii)”, respectively.

The revision reads as follows:

**§ 429.16 Central air conditioners and central air conditioning heat pumps**

(a) \* \* \*

(1) \* \* \*

**Table 1 to Paragraph (a)(1)**

Category	Equipment Subcategory	Required Represented Values
Single-Package Unit	Single-Package AC (including Space-Constrained)	Every individual model distributed in commerce.
	Single-Package HP (including Space-Constrained)	
Outdoor Unit and Indoor Unit (Distributed in Commerce by OUM)	Single-Split-System AC with Single-Stage or Two-Stage Compressor (including Space-Constrained and Small-Duct, High Velocity Systems (SDHV))	Every individual combination distributed in commerce must be rated as a coil-only combination. For each model of outdoor unit, this must include at least one coil-only value that is representative of the least efficient combination distributed in commerce with that particular model of outdoor unit. Additional blower-coil representations are allowed for any applicable individual combinations, if distributed in commerce.
	Single-Split-System AC with Other Than Single-Stage or Two-Stage Compressor (including Space-Constrained and SDHV)	Every individual combination distributed in commerce, including all coil-only and blower coil combinations.
	Single-Split-System HP (including Space-Constrained and SDHV)	Every individual combination distributed in commerce.
	Multi-Split, Multi-Circuit, or Multi-Head Mini-Split Split System - non-SDHV (including Space-Constrained)	For each model of outdoor unit, at a minimum, a non-ducted “tested combination.” For any model of outdoor unit also sold with models of ducted indoor units, a ducted “tested combination.” When determining represented values on or after January 1,

		2023, the ducted “tested combination” must comprise the highest static variety of ducted indoor unit distributed in commerce (i.e., conventional, mid-static, or low-static). Additional representations are allowed, as described in paragraphs (c)(3)(i) and (c)(3)(ii) of this section, respectively.
	Multi-Split, Multi-Circuit, or Multi-Head Mini-Split Split System – SDHV	For each model of outdoor unit, an SDHV “tested combination.” Additional representations are allowed, as described in paragraph (c)(3)(iii) of this section.
Indoor Unit Only Distributed in Commerce by ICM)	Single-Split-System Air Conditioner (including Space-Constrained and SDHV)	Every individual combination distributed in commerce.
	Single-Split-System Heat Pump (including Space-Constrained and SDHV)	
	Multi-Split, Multi-Circuit, or Multi-Head Mini-Split Split System – SDHV	For a model of indoor unit within each basic model, an SDHV “tested combination.” Additional representations are allowed, as described in section (c)(3)(iii) of this section.
Outdoor Unit with no Match		Every model of outdoor unit distributed in commerce (tested with a model of coil-only indoor unit as specified in paragraph (b)(2)(i) of this section).

\* \* \* \* \*

## PART 430 – ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

3. The authority citation for part 430 continues to read as follows:

**Authority:** 42 U.S.C. 6291-6309; 28 U.S.C. 2461 note.

4. Appendix M to subpart B of part 430 is amended:

- a. In paragraph a. of section 3.6.4, by revising the fifth sentence;
- b. In the last sentence of paragraph b., section 3.6.6, by removing “HSPF2” and adding in its place “HSPF”;
- c. In paragraph c., section 3.6.6, footnote 5, Table 15, by removing “HSPF2” and adding in its place “HSPF”;
- d. By revising the heading for section 4.1.3.2;
- e. By revising the heading for section 4.1.4.2;
- f. In section 4.2.5.1, in the “Case 1” paragraph, by removing “3.1.9”, “ $\dot{E}_{hp}(T_j) = \dot{E}_{hp}(T_j)$ ” and adding in its place, “3.1.10”, “ $\dot{E}_h(T_j) = \dot{E}_{hp}(T_j)$ ”, and in the “Case 2” paragraph, by removing “where  $T_o(T_j) > T_{CC}$ ,” and adding in its place “where  $T_o(T_j) < T_{CC}$ ,” respectively;
- g. In section 4.2.5.2, in the “Case 1” paragraph, by removing “3.1.9” and adding in its place “3.1.10” and in the “Case 2” paragraph, by removing “For outdoor bin temperatures where  $T_o(T_j) > T_{CC}$ , determine  $Q_h(T_j)$  and  $\dot{E}_h(T_j)$  using” and adding in its place “For outdoor bin temperatures where  $T_o(T_j) < T_{CC}$ , determine  $Q_h(T_j)$  and  $\dot{E}_h(T_j)$  using”;
- h. In section 4.2.5.3, by removing “3.1.9” and adding in its place “3.1.10” and in the “Case 2” paragraph, by removing “For outdoor bin temperatures where  $T_o^{k=1}(T_j) > T_{CC}$ , determine  $Q_h^{k=1}(T_j)$  and  $\dot{E}_h^{k=1}(T_j)$  using” and adding in its place “For outdoor bin temperatures where  $T_o^{k=1}(T_j) < T_{CC}$ , determine  $Q_h^{k=1}(T_j)$  and  $\dot{E}_h^{k=1}(T_j)$  using”;
- i. In paragraph c. of section 4.2.6, by removing “ $Q_h^{k=2}(5)$ ” and adding in its place “ $Q_h^{k=3}(5)$ ”;
- j. In section 4.2.6.2, in the heading, by removing “ $BL(T_j) < Q_h^{k=2}(T_j)$ ” and adding in its place “ $BL(T_j) \leq Q_h^{k=2}(T_j)$ ”; and



k. By revising the heading for section 4.2.6.3.

The revisions read as follows:

**Appendix M to Subpart B of Part 430—Uniform Test Method for Measuring the Energy**

**Consumption of Central Air Conditioners and Heat Pumps**

\* \* \* \* \*

3. \* \* \*

3.6 \* \* \*

3.6.4 \* \* \*

a. \* \* \* For a cooling/heating heat pump, the compressor shall operate for the H1<sub>N</sub> test at a speed, measured by RPM or power input frequency (Hz), no lower than the speed used in the A2 test if the tested H1<sub>N</sub> heating capacity is less than the tested A2 cooling capacity. \* \* \*

\* \* \* \* \*

4. \* \* \*

4.1.3 \* \* \*

4.1.3.2 Unit Alternates Between High (k=2) and Low (k=1) Compressor Capacity to Satisfy the Building Cooling Load at Temperature T<sub>j</sub>,  $Q_c^{k=1}(T_j) < BL(T_j) < Q_c^{k=2}(T_j)$

\* \* \* \* \*

4.1.4.2 Unit Operates at an Intermediate Compressor Speed (k=i) In Order To Match the Building Cooling Load at Temperature  $Q_c^{k=1}(T_j) < BL(T_j) < Q_c^{k=2}(T_j)$

\* \* \* \* \*

4.2 \* \* \*

4.2.6 \* \* \*

4.2.6.3 Heat Pump Only Operates at Booster (k=3) Compressor Capacity at Temperature T<sub>j</sub>, and its Capacity Is Greater Than or Equal to the Building Heating Load,  $BL(T_j) \leq Q_h^{k=3}(T_j)$ .

\* \* \* \* \*

5. Appendix M1 to subpart B of part 430 is amended:

- a. In section 1.2, by revising the definition of “Minimum-speed-limiting variable-speed heat pump”;
- b. In section 3.1.4.7, by removing “3.14.6” and adding in its place “3.1.4.6”;
- c. By revising paragraph a. of section 3.6.4;
- d. In paragraph d., section 3.6.4, by revising Table 14;
- e. In section 4.1.3.2, in the heading, by removing “ $T_j, Q_c^{k=1}(T_j) < (BL(T_j) < (Q_c^{k=2}(T_j))$ ”, and adding in its place “ $T_j, Q_c^{k=1}(T_j) < BL(T_j) < Q_c^{k=2}(T_j)$ ”;
- f. In section 4.1.4.2, by removing “ $EER^{k=2}(T_j)$ ” and adding in its place “ $EER^{k=2}(T_j)$ ”;
- g. In section 4.2.5.1, in the “Case 1” paragraph by removing “3.1.9” and adding in its place “3.1.10” and removing “ $\dot{E}_{hp}(T_j) = \dot{E}_{hp}(T_j)$ ” and adding in its place “ $\dot{E}_h(T_j) = \dot{E}_{hp}(T_j)$ ”, and in the “Case 2” paragraph by removing “ $T_o(T_j) > T_{CC}$ ,” and adding in its place “ $T_o(T_j) < T_{CC}$ ,”;
- h. In section 4.2.5.2, in the “Case 1” paragraph, by removing “3.1.9” and adding in its place “3.1.10”;
- i. In section 4.2.5.3, in the “Case 1” paragraph, by removing “3.1.9” and adding in its place “3.1.10” and in the “Case 2” paragraph by removing “For outdoor bin temperatures where  $T_o^{k=1}(T_j) > T_{CC}$ , determine  $Q_h^{k=1}(T_j)$  and  $\dot{E}_h^{k=1}(T_j)$  using” and adding in its place and “For outdoor bin temperatures where  $T_o^{k=1}(T_j) < T_{CC}$ , determine  $Q_h^{k=1}(T_j)$  and  $\dot{E}_h^{k=1}(T_j)$  using”;
- j. In paragraph c. of section 4.2.6, by removing “ $Q_h^{k=2}(5)$ ” and adding in its place “ $Q_h^{k=3}(5)$ ”;
- k. In section 4.2.6.2, in the heading, by removing “ $BL(T_j) < Q_h^{k=2}(T_j)$ ” and adding in its place “ $BL(T_j) \leq Q_h^{k=2}(T_j)$ ”; and
- l. In section 4.2.6.3, in the heading, by removing “Heat Pump Only Operates at High (k=3)” and adding in its place “Heat Pump Only Operates at Booster (k=3)”.

The revisions read as follows:

**Appendix M1 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Central Air Conditioners and Heat Pumps**

\* \* \* \*

1. \* \*

1.2 \* \*

*Minimum-speed-limiting variable-speed heat pump* means a heat pump for which the compressor minimum speed (represented by revolutions per minute or motor power input frequency) is higher than its minimum value for operation in a 47 °F ambient temperature for any bin temperature  $T_j$  for which the calculated heating load is less than the calculated intermediate-speed capacity.

\* \* \* \*

3. \* \*

3.6 \* \*

*3.6.4 Tests for a Heat Pump Having a Variable-Speed Compressor*

a. Conduct one maximum temperature test ( $H0_1$ ), two high temperature tests ( $H1_N$  and  $H1_1$ ), one frost accumulation test ( $H2_V$ ), and one low temperature test ( $H3_2$ ). Conducting one or more of the following tests is optional: An additional high temperature test ( $H1_2$ ), an additional frost accumulation test ( $H2_2$ ), and a very low temperature test ( $H4_2$ ). Conduct the optional high temperature cyclic ( $H1C_1$ ) test to determine the heating mode cyclic-degradation coefficient,  $C_D^h$ . If this optional test is conducted but yields a tested  $C_D^h$  that exceeds the default  $C_D^h$  or if the optional test is not conducted, assign  $C_D^h$  the default value of 0.25. Test conditions for the nine tests are specified in Table 14. The compressor shall operate at the same heating full speed, measured by RPM or power input frequency (Hz), as the maximum speed at which the system controls would operate the compressor in normal operation in 17 °F ambient temperature, for the  $H1_2$ ,  $H2_2$  and  $H3_2$  Tests. The compressor shall operate for the  $H1_N$  test at the maximum speed at

which the system controls would operate the compressor in normal operation in 47 °F ambient temperature. Additionally, for a cooling/heating heat pump, the compressor shall operate for the H1<sub>N</sub> test at a speed, measured by RPM or power input frequency (Hz), no lower than the speed used in the A2 test if the tested H1<sub>N</sub> heating capacity is less than the tested A2 cooling capacity.

\* \* \* \*

d. \* \*

TABLE 14—HEATING MODE TEST CONDITIONS FOR UNITS HAVING A VARIABLE-SPEED COMPRESSOR

Test description	Air entering indoor unit temperature ( °F)		Air entering outdoor unit temperature ( °F)		Compressor speed	Heating air volume rate
	Dry bulb	Wet bulb	Dry bulb	Wet bulb		
H0 <sub>i</sub> test (required, steady)	70	60 <sup>(max)</sup>	62	56.5	Heating Minimum	Heating Minimum. <sup>1</sup>
H1 <sub>2</sub> test (optional, steady)	70	60 <sup>(max)</sup>	47	43	Heating Full <sup>4</sup>	Heating Full-Load. <sup>3</sup>
H1 <sub>1</sub> test (required, steady)	70	60 <sup>(max)</sup>	47	43	Heating Minimum	Heating Minimum. <sup>1</sup>
H1 <sub>N</sub> test (required, steady)	70	60 <sup>(max)</sup>	47	43	Heating Full <sup>5</sup>	Heating Full-Load. <sup>3</sup>
H1C <sub>1</sub> test (optional, cyclic)	70	60 <sup>(max)</sup>	47	43	Heating Minimum	( <sup>2</sup> )
H2 <sub>2</sub> test (optional)	70	60 <sup>(max)</sup>	35	33	Heating Full <sup>4</sup>	Heating Full-Load. <sup>3</sup>
H2 <sub>v</sub> test (required)	70	60 <sup>(max)</sup>	35	33	Heating Intermediate	Heating Intermediate. <sup>6</sup>
H3 <sub>2</sub> test (required, steady)	70	60 <sup>(max)</sup>	17	15	Heating Full <sup>4</sup>	Heating Full-Load. <sup>3</sup>
H4 <sub>2</sub> test (optional, steady)	70	60 <sup>(max)</sup>	5	3 <sup>(max)</sup>	Heating Full <sup>7</sup>	Heating Full-Load. <sup>3</sup>

<sup>1</sup>Defined in section 3.1.4.5 of this appendix.

<sup>2</sup>Maintain the airflow nozzle(s) static pressure difference or velocity pressure during an ON period at the same pressure or velocity as measured during the H1<sub>1</sub> test.

<sup>3</sup>Defined in section 3.1.4.4 of this appendix.

<sup>4</sup>Maximum speed that the system controls would operate the compressor in normal operation in 17 °F ambient temperature. The H1<sub>2</sub> test is not needed if the H1<sub>N</sub> test uses this same compressor speed.

<sup>5</sup>Maximum speed that the system controls would operate the compressor in normal operation in 47 °F ambient temperature.

<sup>6</sup>Defined in section 3.1.4.6 of this appendix.

<sup>7</sup>Maximum speed that the system controls would operate the compressor in normal operation at 5°F ambient temperature.

\* \* \* \* \*

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